



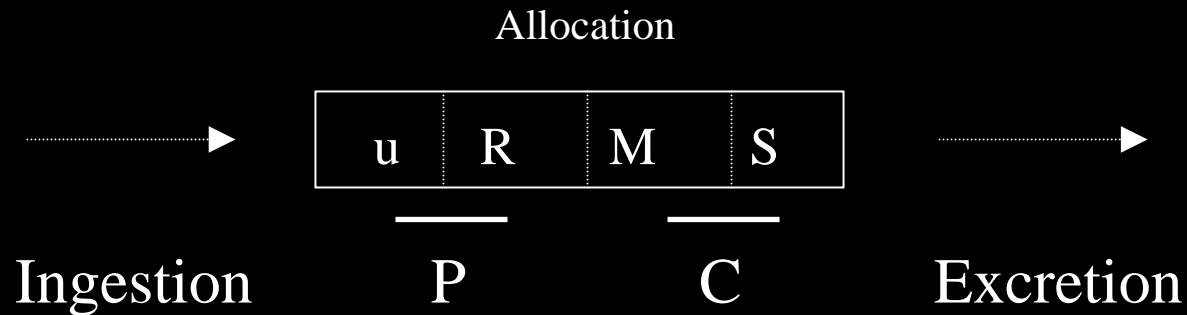
# Environmental Variance: Effects on Organismal Life History

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# Fundamental Question:

How does environmental variability affect organisms and their ecosystem functions in food web transfer and nutrient cycling?

# Concept to Application



## Response:

Growth (u) - Phosphorus limited

Reproduction (R) – Phosphorus limited

Maintenance of Biomass (M) – Carbon limited

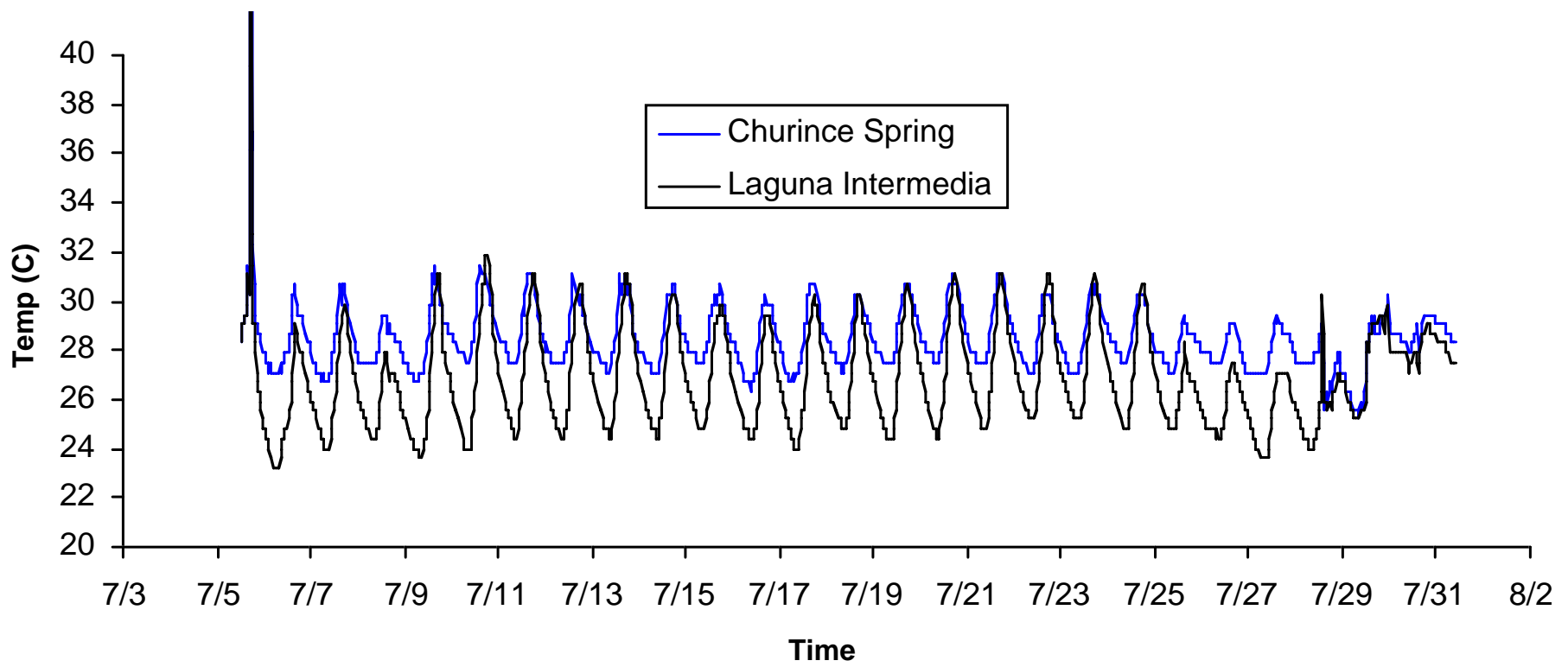
Storage (S) – Carbon limited



# Churince

Natural Laboratory  
Gradients of Variance







- Wee Beasties -

Amphipod

(*Hyalella azteca*)

- Ubiquitous in Cuatro Ciénegas
- Easily cultured
- Often used in aquatic toxicology
- Dominant
- Omnivore
- Long lifespan – experiences seasonal and daily variation

# Hypotheses:

1. Environmental variability will result in reduced growth by an organism relative to stable environmental conditions.
2. In conditions of high environmental variability, organism will exhibit a decreased sensitivity to poor stoichiometric food quality (high C:P ratio).
3. Local adaptation to environmental variability will mitigate the effects of environmental variability, resulting in higher growth.



# Lab Experiment (3x2)

Manipulated C:P ratio of food

Low C:P (good) = MON

High C:P (bad) = LOP

Manipulated temp. variability

Stable (mean = 25 C)

variable (4 C/ day)

Manipulated site of origin

Churince = more stable

Laguna Intermedia = variable

Response Variable

Growth (mg)



Churince



Laguna Intermedia



# Details

- Amphipods housed in individual microcosms
- Amphipods housed in growth chambers receiving 12h daylight
- Food quantity standardized by carbon
- Mean starting size = 0.6 mg
- Growth data taken after 21 days

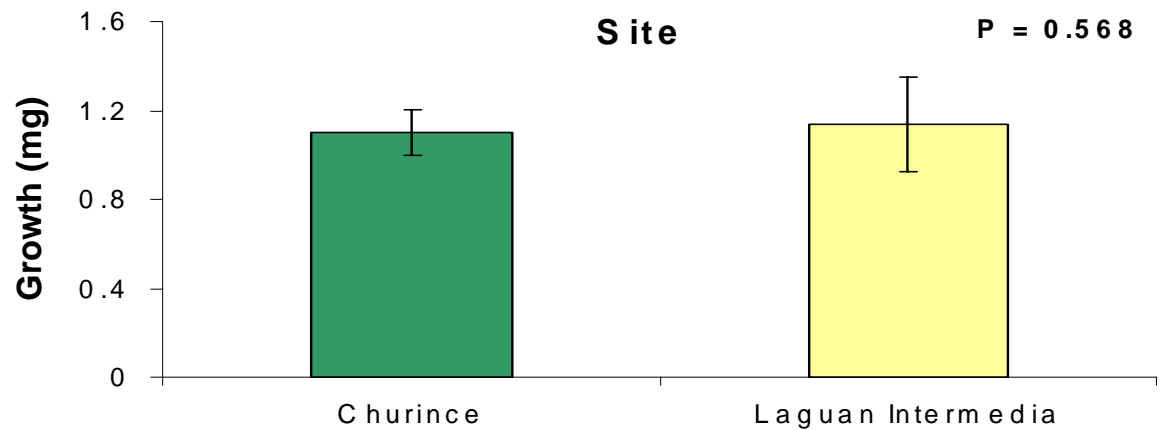
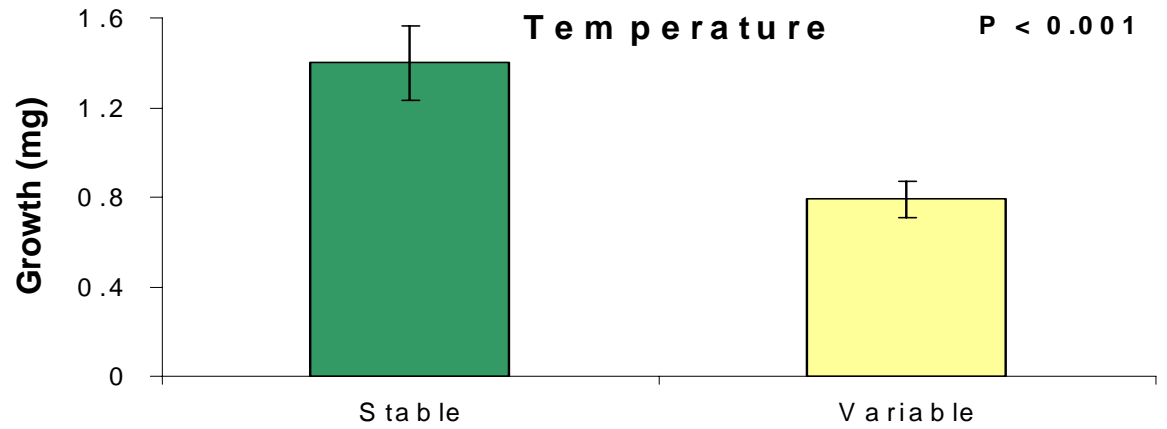
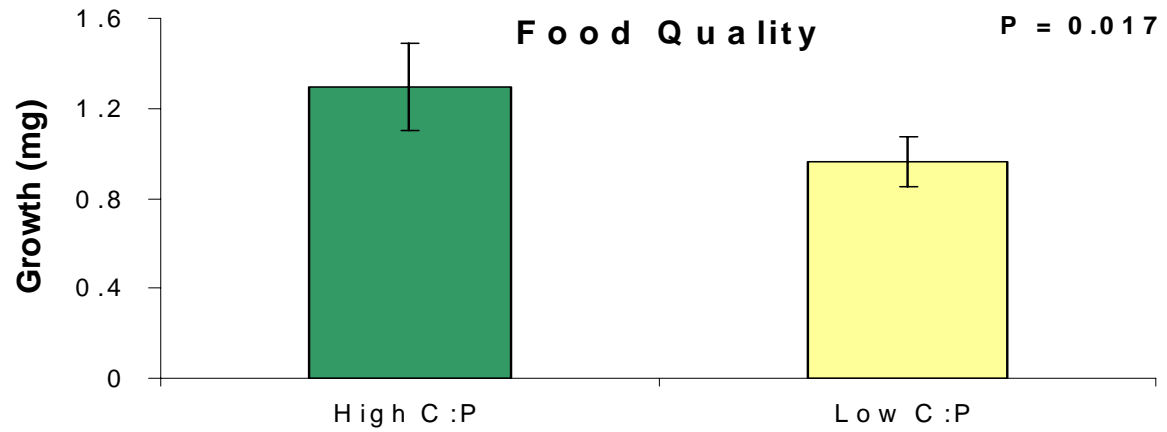


Churince



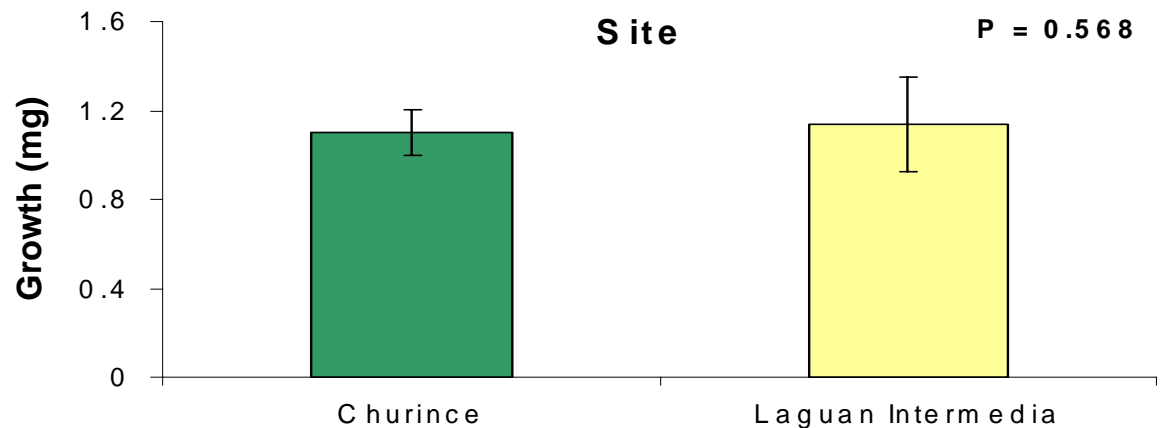
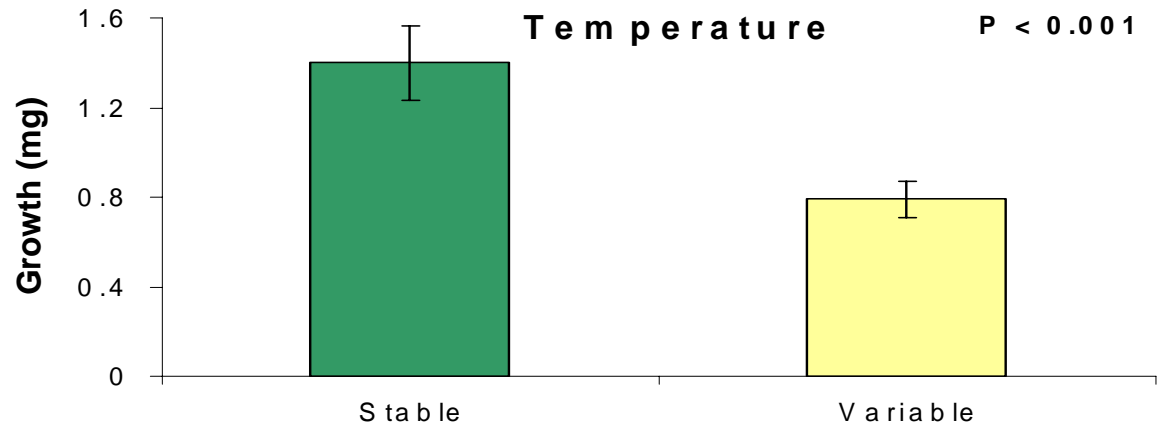
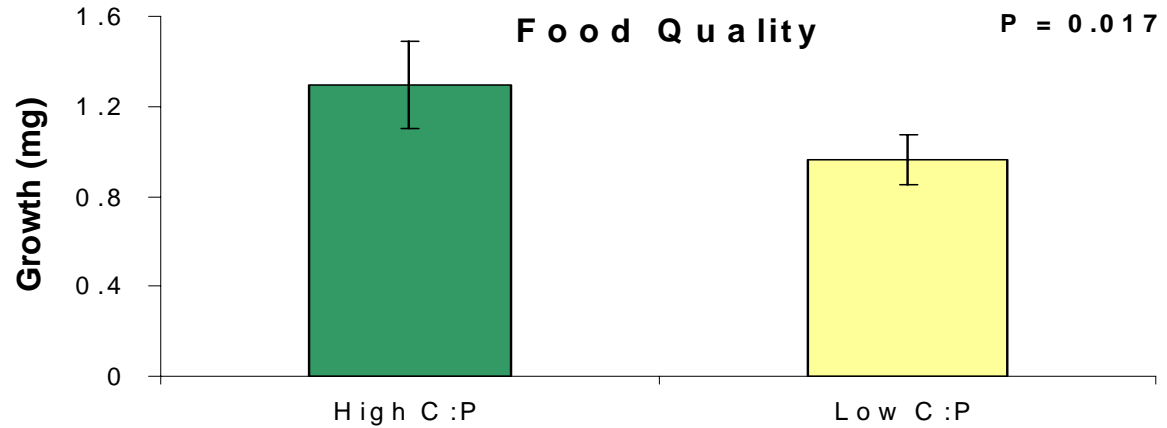
Laguna Intermedia

# Response to lower C:P

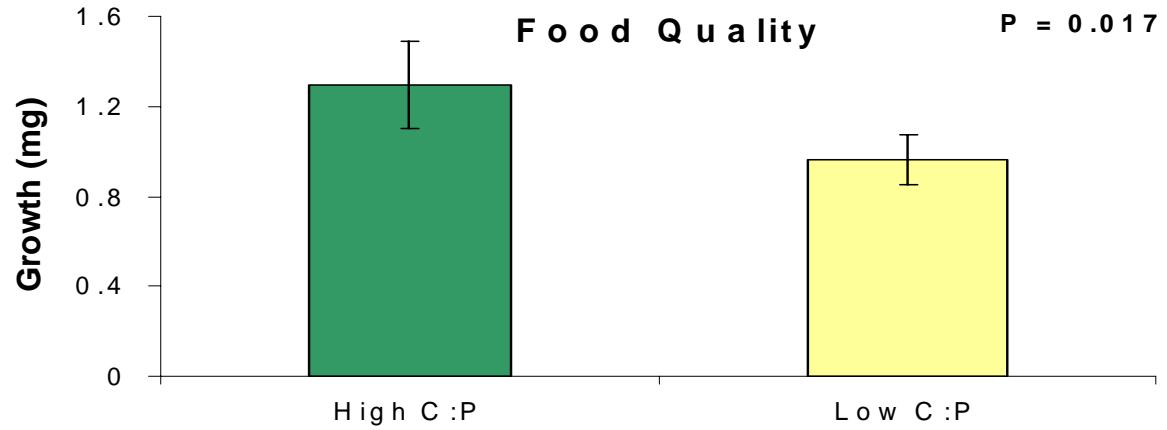


Response to  
lower C:P

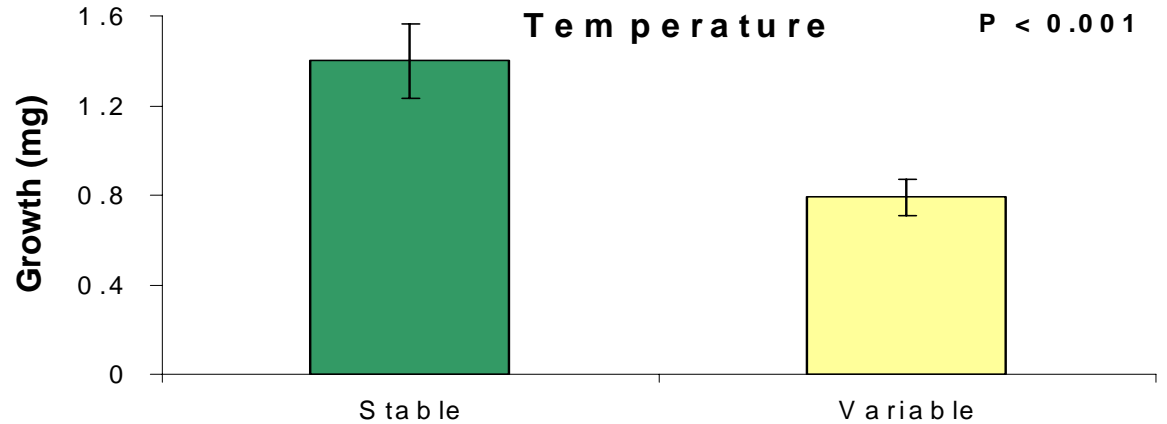
Response to  
temp variability



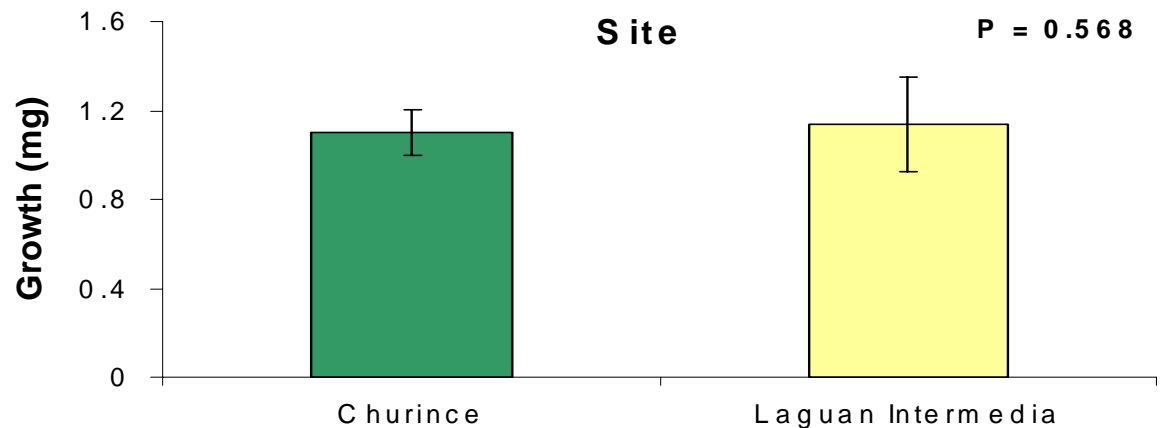
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Response to  
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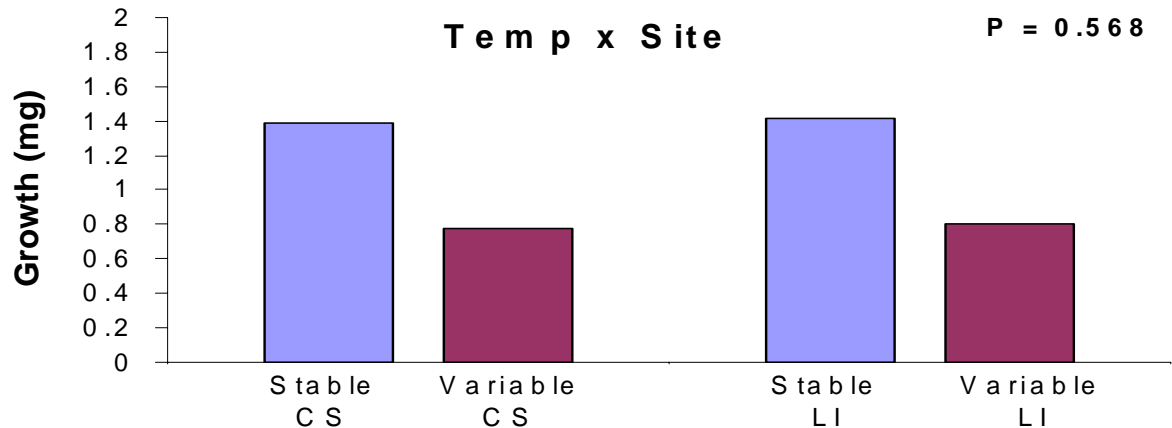
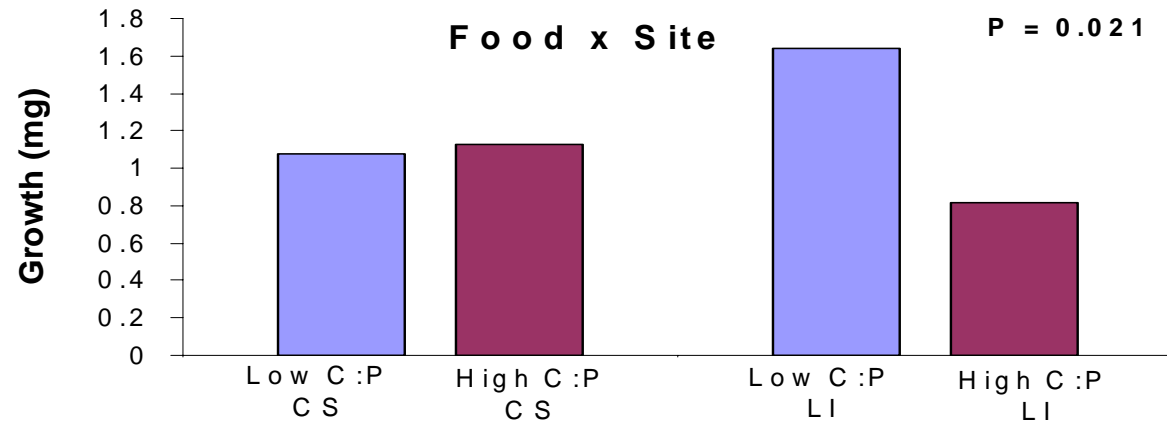
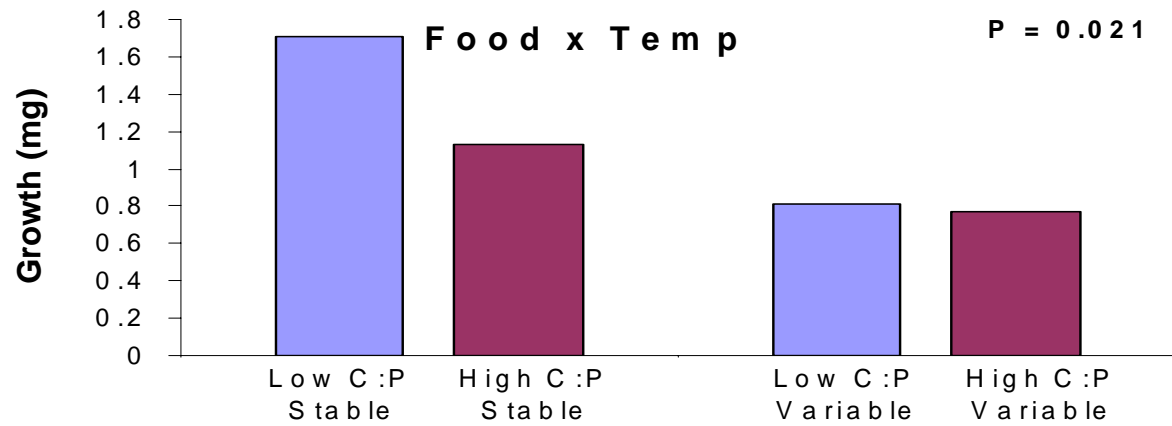


No site difference



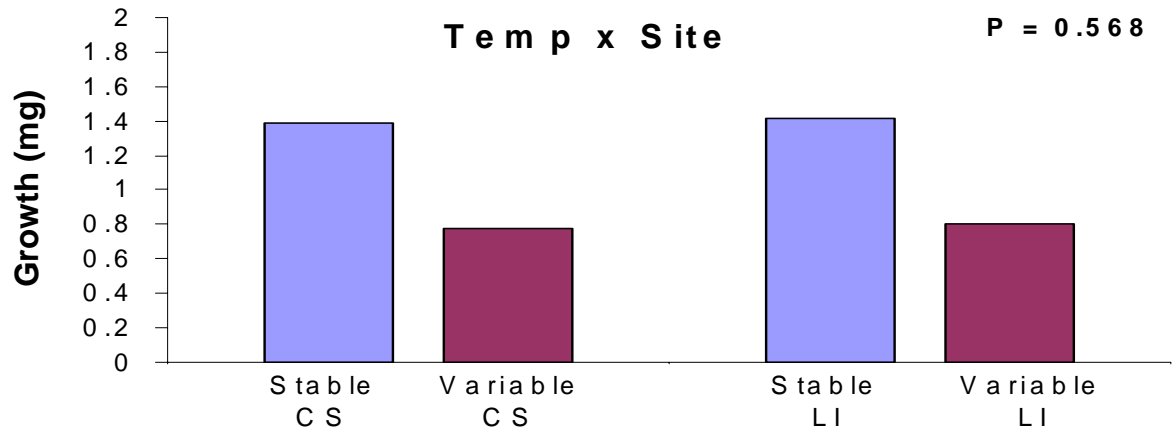
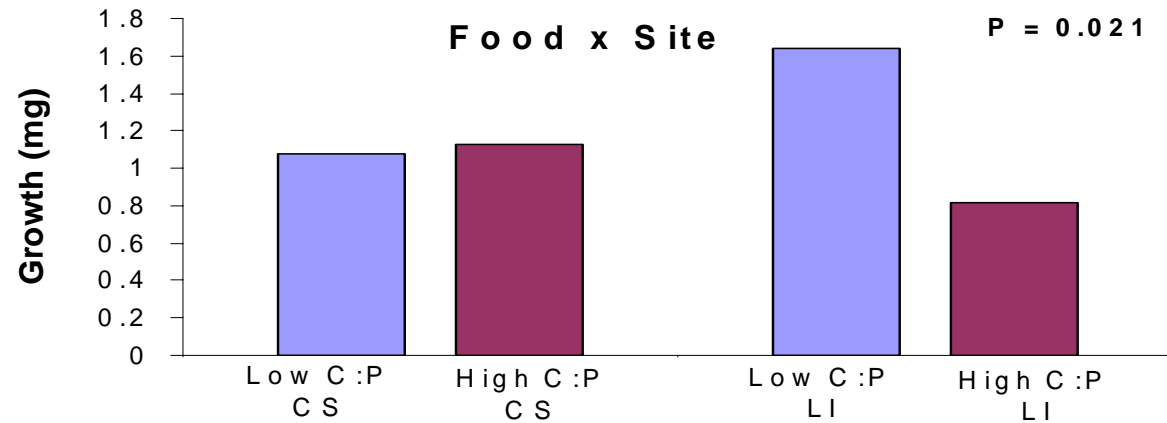
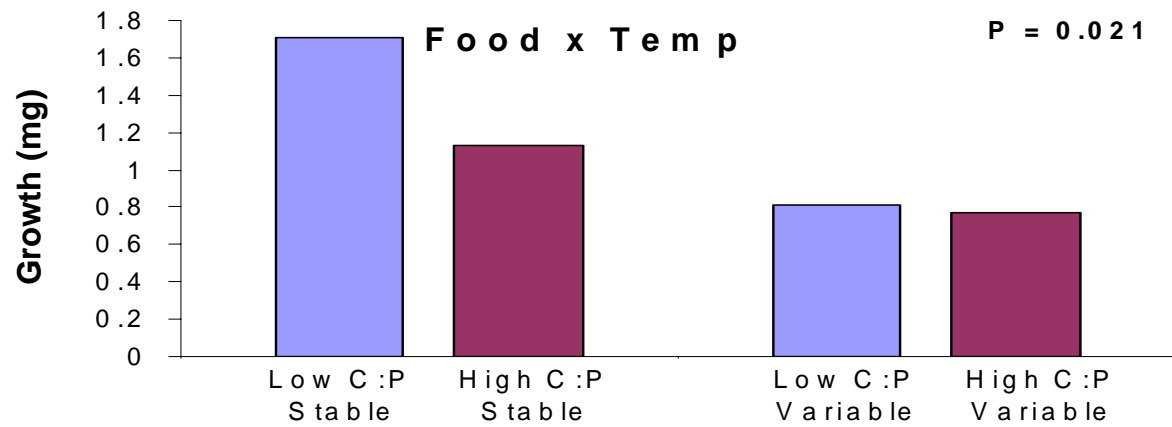


# Variable temp Changed C:P response



Variable temp  
Changed C:P  
response

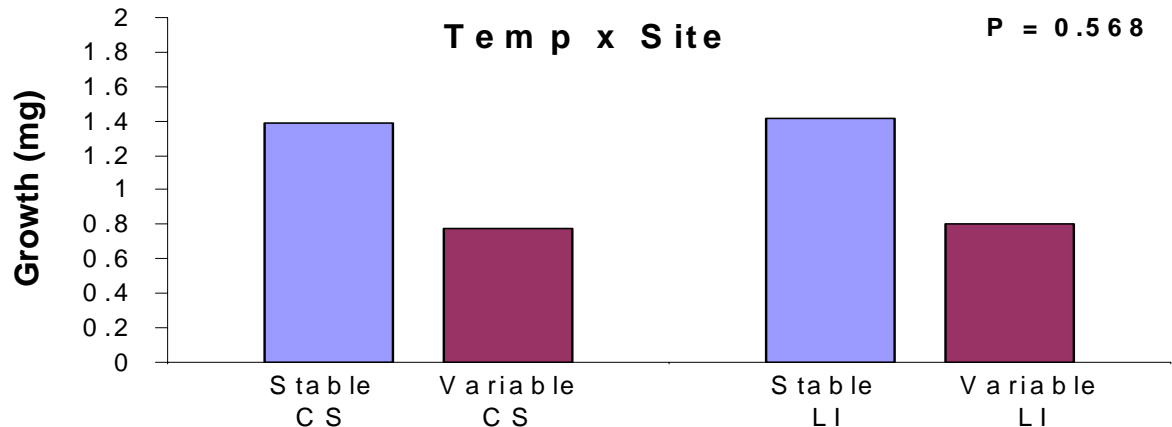
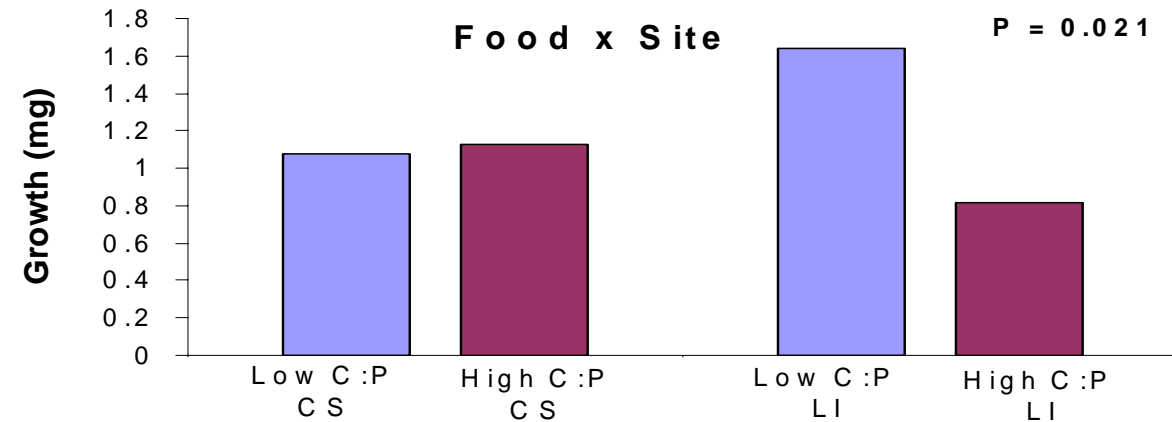
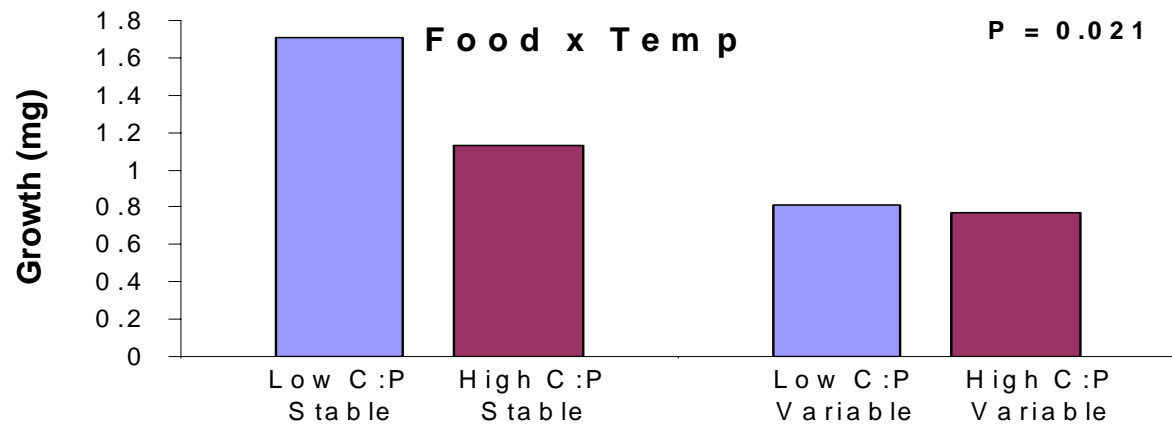
Only LI  
amphipods  
Responded to C:P



Variable temp  
Changed C:P  
response

Only LI  
amphipods  
Responded to C:P

Variable temp  
Affected both sites



# Conclusion:

1. Environmental variability will result in reduced growth by an organism relative to stable environmental conditions.  
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YES, significant food quality effect was a result of a response only in the stable temp treatment. We saw a significant interaction between temperature variability and food quality treatments.

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YES, independent of collection site and food quality treatments amphipods in variable environment grew significantly slower.
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YES, significant food quality effect was a result of a response only in the stable temp treatment. We saw a significant interaction between temperature variability and food quality treatments.
3. Local adaptation to environmental variability will mitigate the effects of environmental variability, resulting in higher growth.  
MAYBE - no significant effect of collection site or significant interaction between temperature variability and collection site; however, only the LI amphipods responded positively to the food quality treatment.

